Abstract

E-business companies are currently grappling with the complex task of determining the right prices to charge a customer for a product or a service This task requires that a company know not only its own operating costs and availability of supply but also how much the customers value the product and what the future demands are likely to be A company therefore needs a wealth of information about its customers and also be able to adjust its prices at minimal cost Advances in Internet technologies and e-commerce have dramatically increased the quantum of information the sellers can gather about customers and have provided universal connectivity to customers making it easy to change the prices This has led to increased adoption of dynamic pricing and to increased interest in dynamic pricing research Recent research has shown that the prices will have to be adjusted in fairly sophisticated ways, based on sound mathematical models, to reap the benefits of dynamic pricing Among the emerging models for capturing dynamic pricing issues in e-business markets, reinforcement learning (RL) has proved to be quite appealing because of the way it enables maximum use of typical information available in e-business markets Motivated by this, this thesis attempts to originate innovative dynamic pricing strategies for e-business markets (in particular, electronic retail markets) using RL-based models It is hoped that the findings of the thesis will make automated price bots or pricing agents a reality in the emerging digital economy

The thesis is in three parts In the first part, we consider single seller monopolistic electronic markets and model the dynamic pricing problem using the seller as the learning agent We consider two different and representative market settings. In both the settings, we show that the model is a classical Markov decision process with RL immediately applicable We use the Q-learning algorithm as the solution methodology and obtain useful dynamic pricing and inventory control insights In the second part, we investigate the dynamic pricing problem in multi-seller electronic markets with sellers competing against one another. With multiple learning agents in the fray, the problem becomes

more interesting and complex, and calls for use of appropriate algorithms such as actor-critic algorithms to solve the resulting dynamic pricing problem The investigations in the first part and the second part motivate us to look out for faster algorithms So, in the third part, we come up with a new, more efficient actor-critic algorithm for solution of infinite horizon Markov decision processes with finite state space and finite action space under a discounted cost criterion